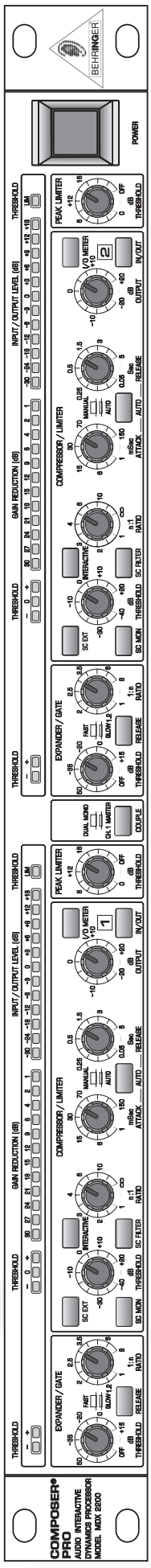
COMPOSER PRO MDX2200



User´s Manual

Bedienungsanleitung

E

D

Version 1.1 May 1998

BEHRINGER®

www.behringer.de

CE

EG-Declaration of Conformity

BEHRINGER®

INTERNATIONAL GmbH

acc. to the Directives 89/336/EWG and 73/23/EWG

We, **BEHRINGER INTERNATIONAL GmbH**

Hanns-Martin-Schleyer-Straße 4

D - 47877 Willich

Name and address of the manufacturer or the introducer of the product on the market who is established in the EC

herewith take the sole responsibility to confirm that the product:

COMPOSER PRO MDX2200

Type designation and, if applicable, Article-Nº

which refers to this declaration, is in accordance with the following standards or standardized documents:

- ☒ **EN 60065**
- ☒ **EN 55020**
- ☒ **EN 55013**
- ☒ **EN 61000-3-2**
- ☒ **EN 61000-3-3**

The following operation conditions and installation arrangements have to be presumed:

acc. to Operating Manual

BEHRINGER
INTERNATIONAL GmbH
Hanns-Martin-Schleyer-Str. 36-38
D-47877 Willich-Münchheide II
Tel.-Nr. 0 21 54 / 92 06-0
Fax-Nr. 0 21 54 / 92 06-30

B. Nier, President — Willich, 01.05.1998

Name, address, date and legally binding signature of the person responsible

SAFETY INSTRUCTIONS

CAUTION: To reduce the risk of electrical shock, do not remove the cover (or back). No user serviceable parts inside; refer servicing to qualified personnel.

WARNING: To reduce the risk of fire or electrical shock, do not expose this appliance to rain or moisture.

E

This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure - voltage that may be sufficient to constitute a risk of shock.

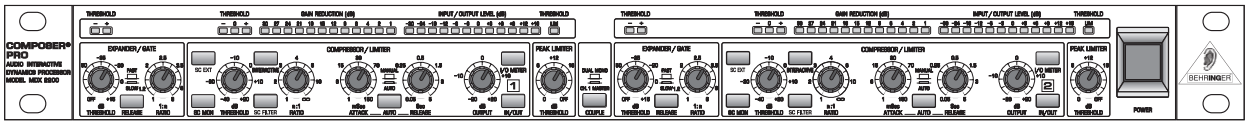
This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Read the manual.

DETAILED SAFETY INSTRUCTIONS:
All the safety and operation instructions should be read before the appliance is operated.
Retain Instructions:
The safety and operating instructions should be retained for future reference.
Heed Warnings:
All warnings on the appliance and in the operating instructions should be adhered to.
Follow instructions:
All operation and user instructions should be followed.
Water and Moisture:
The appliance should not be used near water (e.g. near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool etc.).
Ventilation:
The appliance should be situated so that its location or position does not interfere with its proper ventilaton. For example, the appliance should not be situated on a bed, sofa rug, or similar surface that may block the ventilation openings: or placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
Heat:
The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliance (including amplifiers) that produce heat.
Power Source:
The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
Grounding or Polarization:
Precautions should be taken so that the grounding or polarization means of an appliance is not defeated.
Power-Cord Protection:
Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords and plugs, convenience receptacles and the point where they exit from the appliance.
Cleaning:
The appliance should be cleaned only as recommended by the manufacturer.
Non-use Periods:
The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
Object and Liquid Entry:
Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
Damage Requiring Service:
The appliance should be serviced by qualified service personnel when:
- The power supply cord or the plug has been damaged; or
- Objects have fallen, or liquid has been spilled into the appliance; or
- The appliance has been exposed to rain; or
- The appliance does not appear to operate normally or exhibits a marked change in performance; or
- The appliance has been dropped, or the enclosure damaged.

Servicing:
The user should not attempt to service the appliance beyond that is described in the Operating Instructions. All other servicing should be referred to qualifield service personnel.

COMPOSER PRO

Interactive 2-channel expander/gate/compressor/limiter of the reference class



- ▲ IKA (Interactive Knee Adaptation) compressor concept combines the advantages of „hard knee“ and „soft knee“ characteristics
- ▲ Attack and Release times controllable automatically or manually
- ▲ Switchable high-pass filter in control signal path avoids low-frequency signals from dominating compressor action
- ▲ Compression characteristics switchable between IKA and „hard knee“ characteristics
- ▲ IRC circuit in expander/gate allows for „inaudible“ elimination of disturbing noise signals
- ▲ IGC (Interactive Gain Control) peak limiter combines clipper with program limiter circuits
- ▲ Extremely low-noise operational amplifiers and high-grade VCA’s
- ▲ High-quality detent potentiometers and backlit switches
- ▲ Stereo Couple function selectable with real totaling of RMS output
- ▲ Accurate 12-digit LED meters for input level, output level and gain reduction
- ▲ Traffic-light function for easy threshold setting
- ▲ Switchable side-chain input with side-chain monitor function
- ▲ Operating level switchable from +4 dBu to -10 dBV
- ▲ Servo-balanced inputs and outputs featuring 6.3 mm jack and XLR connectors
- ▲ High-grade output transformer BEHRINGER OT-1 can be retrofitted
- ▲ Relay-controlled hard-bypass switch with auto-bypass function (fail-safe relay)
- ▲ Manufactured under the stringent ISO9000 management system

MDX2200

FOREWORD

Dear Customer,

Welcome to the team of COMPOSER PRO users and thank you very much for expressing your confidence in BEHRINGER products by purchasing this unit.

It is one of my most pleasant tasks to write this letter to you, because it is the culmination of many months of hard work delivered by our engineering team to reach a very ambitious goal: making an outstanding device better still. The COMPOSER has for quite a long time been a standard tool used by numerous studios and P.A. rental companies. The task to improve one of our best-selling products certainly meant a great deal of responsibility, which we assumed by focusing on you, the discerning user and musician. It also meant a lot of work and night shifts to accomplish this goal. But it was fun, too. Developing a product usually brings a lot of people together, and what a great feeling it is when everybody who participated in such a project can be proud of what we've achieved.

It is our philosophy to share our joy with you, because you are the most important member of the BEHRINGER family. With your highly competent suggestions for new products you've greatly contributed to shaping our company and making it successful. In return, we guarantee you uncompromising quality (manufactured under ISO9000 certified management system) as well as excellent technical and audio properties at an extremely favorable price. All of this will enable you to fully unfold your creativity without being hampered by budget constraints.

We are often asked how we can make it to produce such high-grade devices at such unbelievably low prices. The answer is quite simple: it's you, our customers! Many satisfied customers means large sales volumes enabling us to get better conditions of purchase for components, etc. Isn't it only fair to pass this benefit back to you? Because we know that your success is our success, too!

I would like to thank all people whose help on „Project COMPOSER PRO" has made it all possible. Everybody has made very personal contributions, starting from the designers of the unit via the many staff members in my company to you, the user of BEHRINGER products.

My friends, it's been worth the trouble!

Thank you very much,

Uli Behringer

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1. INTRODUCTION

In purchasing the new COMPOSER PRO Model MDX 2200, you have acquired an extremely efficient and universal dynamics processor, which combines the most commonly used dynamic functions within a compact stereo unit: every channel has its own independent Compressor/Limiter, an Expander/Gate and a Peak Limiter. The precision and flexibility of the functions are the main outstanding features of this high end unit.

Despite the extremely complex internal circuitry, the unit has a control surface which is clearly laid out and easy to understand. The internal design of the unit, together with its external side-chain path, gives the user unsurpassed creative flexibility when processing sound.

Advanced Behringer Technology

Compared to its predecessors, the COMPOSER PRO offers several advanced features such as the extended LED meters for ease of operation when setting the threshold, the adjustable expansion ratio in the expander/gate section and the side-chain filter. Additionally, we have succeeded in refining the audio properties as well as the circuit topology.

For the first time, the COMPOSER PRO MDX 2200 uses SMD technology (Surface Mounted Device). These sub-miniature components known from aerospace technology allow for an extreme packing density, plus improve the unit's reliability.

IKA (Interactive Knee Adaption) Compressor

Our proven IKA (Interactive Knee Adaptation) circuit successfully combines the concept of a "hard knee" compressor with the characteristics of a "soft knee" approach. This program-dependent regulation scheme forms the prerequisite both for "inaudible" and musical program compression and for creative and highly effective dynamics processing.

With its IKA circuit the COMPOSER PRO is capable of delivering outstanding musical results both in studio and live P.A. applications.

Additionally, the COMPOSER PRO's side-chain filter allows for limiting the influence low-frequency signal portions usually have on the control logic, so that the compression ratio is mainly determined by those frequencies that are essential to the loudness perceived by the listener - the midrange frequencies.

IRC (Interactive Ratio Control) Expander

A basic problem in the use of a compressor is the fact that the noise floor is highly amplified during quiet sections or when there are music pauses. This effect is exaggerated when the compression ratio is inappropriate. In order to eliminate this problem, one would normally use an additional expander or gate. The noise is then simply faded out in the quiet sections. However, simple expanders, even when they are used correctly, drastically cut signals below the preset threshold. This effect becomes more noticeable during the transition from signal to noise floor. This can mean, that the start or end of words can be cut on a vocal track.

A newly developed IRC (Interactive Ratio Control) Expander has been integrated into the COMPOSER PRO the ratio of which, is automatically adjusted, depending on the program material. The result is an expander which is less critical of adjustment and which is more tolerant in the presence of those signals which appear slightly above the noise floor. Because of its new IRC circuit design, the Behringer COMPOSER PROs Expander/Gate section can be used as an independent unit to eradicate noise offering almost limitless possibilities within this application.

IGC (Interactive Gain Control) Peak Limiter

A further remarkable feature of the Behringer COMPOSER PRO is the IGC (Interactive Gain Control) Limiter, an intelligent combination of a clipper and a program limiter. Above an adjustable threshold the peak limiter begins to function and restricts signal peaks radically (clipper). If however, the threshold of the limiter was surpassed for more than a few milliseconds, the IGC circuit automatically kicks in and reduces the level of the overall output signal so that no audible distortion occurs (program limiter). After the level falls below the threshold, the signal returns to the original value after a period of about 1 second. This IGC circuit proves to be extremely valuable as much for live work (loudspeaker protection) as for digital situations, where any extreme signal peaks would exceed the maximum headroom and therefore would cause severe problems. The following

instructions should initially familiarize you with the special terms used, so that you can get to know all the functions of the unit. After you have read the instructions carefully, please put them away safely, so that you can refer to them again if necessary.

1.1 Technical Background

By employing current modern analogue technology it is possible to manufacture audio equipment with a dynamic range of up to 125 dB. In contrast to analogue techniques, the dynamic range of digital equipment is approximately 25 dB less. With conventional record and tape recorder technology, as well as broadcasting, this value is further reduced. Generally, dynamic restrictions are due to noisy storage in transmission media and also the maximum headroom of these systems.

1.1.1 Noise As A Physical Phenomenon

All electrical components produce a certain level of inherent noise. Current flowing through a conductor leads to uncontrolled random electron movements. For statistical reasons, this produces frequencies within the whole audio spectrum. If these currents are highly amplified, the result will be perceived as noise. Since all frequencies are equally affected, we term this white noise. It is fairly obvious that electronics cannot function without components. Even if special low-noise components are used, a certain degree of basic noise cannot be avoided.

This effect is similar when replaying a tape. The non-directional magnetic particles passing the replay head can also cause uncontrolled currents and voltages. The resulting sound of the various frequencies is heard as noise. Even the best possible tape biasing can “only“ provide signal-to-noise ratios of about 70 dB, which is not acceptable today since the demands of listeners have increased. Due to the laws of physics, improving the design of the magnetic carrier is impossible using conventional means.

1.1.2 What Are Audio Dynamics?

A remarkable feature of the human ear is that it can detect the most wide ranging amplitude changes - from the slightest whisper to the deafening roar of a jet-plane. If one tried to record or reproduce this wide spectrum of sound with the help of amplifiers, cassette recorders, records or even digital recorders (CD, DAT etc.), one would immediately be restricted by the physical limitations of electronic and acoustic sound reproduction technology.

The usable dynamic range of electro-acoustic equipment is limited as much at the low end as at the high end. The thermal noise of the electrons in the components results in an audible basic noise floor and thus represents the bottom limit of the transmission range. The upper limit is determined by the levels of the internal operating voltages; if they are exceeded, audible signal distortion is the result. Although in theory, the usable dynamic range sits between these two limits, it is considerably smaller in practice, since a certain reserve must be maintained to avoid distortion of the audio signal if sudden level peaks occur. Technically speaking, we refer to this reserve as “headroom“ - usually this is about 10 - 20 dB. A reduction of the operating level would allow for greater headroom, i.e. the risk of signal distortion due to level peaks would be reduced. However, at the same time, the basic noise floor of the program material would be increased considerably.

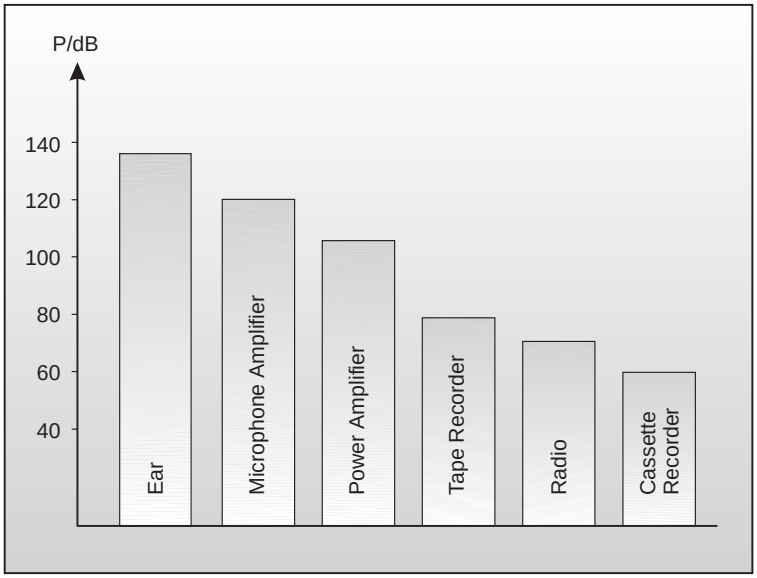

Fig. 1.1: The dynamic range capabilities of various devices

It is therefore useful to keep the operating level as high as possible without risking signal distortion in order to achieve optimum transmission quality.

It is possible to further improve the transmission quality by constantly monitoring the program material with the aid of a volume fader, which manually levels the material. During low passages the gain is increased, during loud passages the gain is reduced. Of course it is fairly obvious that this kind of manual control is rather restrictive; it is difficult to detect signal peaks and it is almost impossible to level them out. Manual control is simply not fast enough to be satisfactory.

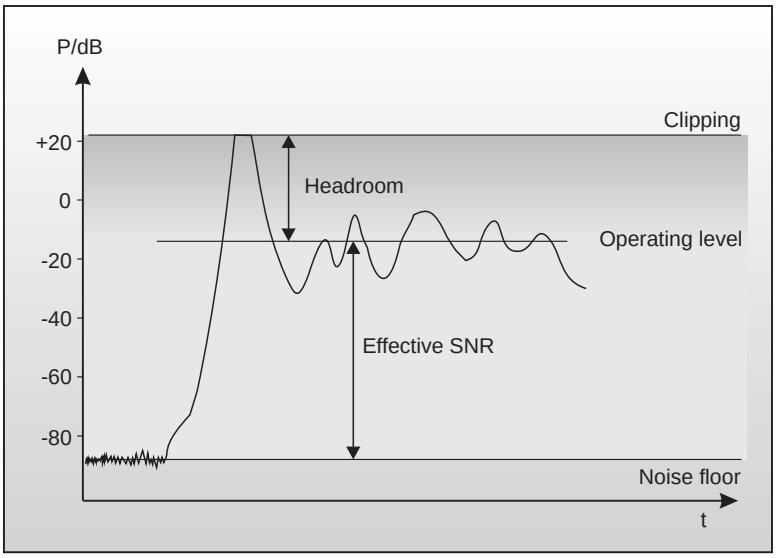

Fig. 1.2: The interactive relationship between the operating level and the headroom

The need therefore arises for a fast acting automatic gain control system which will constantly monitor the signals and which will always adjust the gain to maximize the signal-to-noise ratio without incurring signal distortion. This device is called a compressor or limiter. This system is a part of the Behringer COMPOSER PRO.

1.1.3 Compressors/Limiters

By measuring the dynamic range of musical instruments in live recording situations, you will find that extreme amplitudes occur which often lead to overload in subsequent signal processing equipment. Especially in broadcasting and record cutting techniques, these signal peaks can lead to heavy distortion. To avoid this kind of distortion or, for example, to avoid loudspeakers being damaged by overload, Compressors or Limiters are used.

The principal function used in these devices is dependent on an automatic gain control as mentioned in the previous section, which reduces the amplitude of loud passages and therefore restricts the original dynamics to a desired range. This application is particularly useful in microphone recording techniques, to compensate for level changes which are caused by varying microphone distances. Although compressors and limiters perform similar tasks, one essential point makes them different: Limiters abruptly limit the signal above a certain level, while compressors control the signal “gently“ over a wider range. A limiter continuously monitors the signal and intervenes as soon as the level exceeds a user-adjustable threshold. Any signal exceeding this threshold will be immediately returned to the adjusted level.

A Compressor also monitors the program material continuously and has a certain threshold level. With compression, in contrast to the action of a limiter, signals are not reduced in level abruptly once the threshold has been exceeded, but are returned to the threshold gradually. The signal is reduced in gain, relative to the amount the signal exceeds this point.

Generally, threshold levels for compressors are set below the normal operating level to allow for the upper dynamics to be musically compressed. For limiters, the threshold point is set above the normal operating level in order to provide reliable signal limiting, to protect subsequent equipment from signal overload.

1.1.4 Expanders/Noise-Gates

Audio, in general, is only as good as the source from which it was derived. The dynamic range of signals will often be restricted by noise. Synthesizers, effects devices, guitar pickups, amplifiers etc. generally produce a high level of noise, hum or other ambient background hiss, which can disturb the quality of the program material.

Normally these noises are inaudible if the level of the desired signal lies significantly above the level of the noise. This perception by the ear is based on the “masking“ effect: noise will be masked and thus becomes inaudible as soon as considerably louder sound signals in the same frequency band are added. Nevertheless, the further the level that the desired signal decreases, the more the noise floor becomes a disturbing factor. Expanders or noise-gates offer a solution for this problem: these devices attenuate signals when their amplitudes drop, thereby fading out the background noise. Relying on this method, gain controlling amplifiers, like expanders, can extend the dynamic range of a signal and are therefore the opposite of a compressor.

In practice, it is shown that an expansion over the entire dynamic range is not desired. With an expansion ratio of 5:1 and a processed dynamic range of 30 dB, an output dynamic range of 150 dB will be the result, exceeding all subsequent signal processors, as well as human hearing. Therefore, the amplitude control is restricted to signals whose levels are below a certain threshold. Signals above this threshold pass through the unit unchanged. Due to the continuous attenuation of the signals below this threshold, this kind of expansion is termed “downward“ expansion.

The noise-gate is the simplest form of an expander: in contrast to the expander, which continuously attenuates a signal below the threshold, the noise-gate cuts off the signal abruptly. In most applications this method is not very useful, since the on/off transition is too drastic. The onset of a simple gate function appears very obvious and unnatural. To achieve inaudible processing of the program material, it is necessary to be able to control the signal’s envelope parameters. This is part of the many features of the COMPOSER PRO.

2. THE DESIGN CONCEPT

2.1 High Quality Components And Design

The philosophy behind Behringer products guarantees a no-compromise circuit design and employs the best choice of components. The operational amplifiers NJM4580 which are used in the COMPOSER PRO, are exceptional. They boast extreme linearity and very low distortion characteristics. The most important aspect of the COMPOSER PRO design is a radical VCA implementation which results in outstanding technical specification and excellent performance. To complement this design the choice of components includes high tolerance resistors and capacitors, detent potentiometers, gold plated relay contacts and several other stringently selected elements.

For the first time, the COMPOSER PRO MDX 2200 uses SMD technology (Surface Mounted Device). These sub-miniature components known from aerospace technology allow for an extreme packing density, plus the unit's reliability could be improved. Additionally, the unit is manufactured in compliance with a ISO9000 certified management system.

2.1.1 Failsafe Relays

Failsafe relays have been incorporated into the design of the Behringer COMPOSER PRO, which automatically and silently bypass the unit in the event of power supply disconnection or failure. These relays are also active at switch-on to isolate the COMPOSER PRO until the power rails have settled, thus preventing the possibility of a potentially damaging switch-on thump.

2.2 Inputs And Outputs

2.2.1 Balanced Inputs And Outputs

As standard, the Behringer COMPOSER PRO is installed with electronically servo-balanced inputs and outputs. The new circuit design features automatic hum and noise reduction for balanced signals and thus allows for trouble-free operation, even at high operating levels. Externally induced mains hum etc. will be effectively suppressed. The automatic servo-function recognizes the presence of unbalanced connectors and adjusts the nominal level internally to avoid level differences between the input and output signals (correction 6 dB).

2.2.2 Transformer Balanced Outputs (Optional)

In contrast to electronic balancing, the use of transformer-balanced outputs offers the advantage of galvanic separation between units. Electrical potential differences and ground loops in audio installations do not therefore impair the performance of the units. The transformer-balanced outputs, commonly used in radio and TV engineering, can also be fitted retrospectively upon request. The Behringer transformer OT-1 is designed to the highest exacting standards and is available as an accessory.

3. INSTALLATION

Your Behringer COMPOSER PRO was carefully packed in the factory and the packaging was designed to protect the unit from rough handling. Nevertheless, we recommend that you carefully examine the packaging and ist contents for any signs of physical damage, which may have occurred in transit.

☞ **If the unit is damaged, please do not return it to us, but notify your dealer and the shipping company immediately, otherwise claims for damage or replacement may not be granted. Shipping claims must be made by the consignee.**

E

3.1 Rack Mounting

The Behringer COMPOSER PRO fits into one standard 19" rack unit of space (1 3/4"). Please allow at least an additional 4" depth for the connectors on the back panel. Be sure that there is enough air space around the unit for cooling and please do not place the COMPOSER PRO on high temperature devices such as power amplifiers etc. to avoid overheating.

3.2 Mains voltage

Before you connect your COMPOSER PRO to the mains, please make sure that your local voltage matches the voltage required by the unit! The fuse holder on the female mains connector has 3 triangular markers, with two of these triangles opposing each other. Your COMPOSER PRO is set to the operating voltage printed next to these markers, and can be set to another voltage by turning the fuse holder by 180°. **CAUTION: this instruction does not apply to export models exclusively designed, e.g. for 115 V operation!**

3.3 Audio connections

The audio inputs and outputs on the Behringer COMPOSER PRO are fully balanced. If possible, connect the unit to other devices in a balanced configuration to allow for maximum interference immunity.

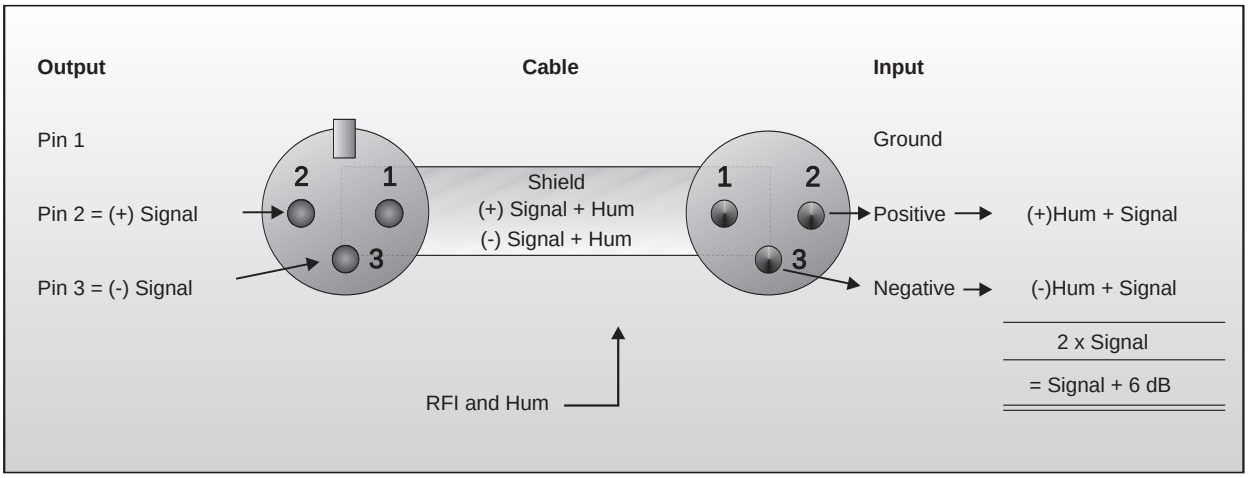

Fig. 3.1: Compensation of interference with balanced connections

Critical applications may require to build up a transformer-balanced configuration for the output signals, so as to avoid interference from ground loops or potential differences. For this purpose, we offer our high-quality output transformer OT-1 as a retrofit kit.

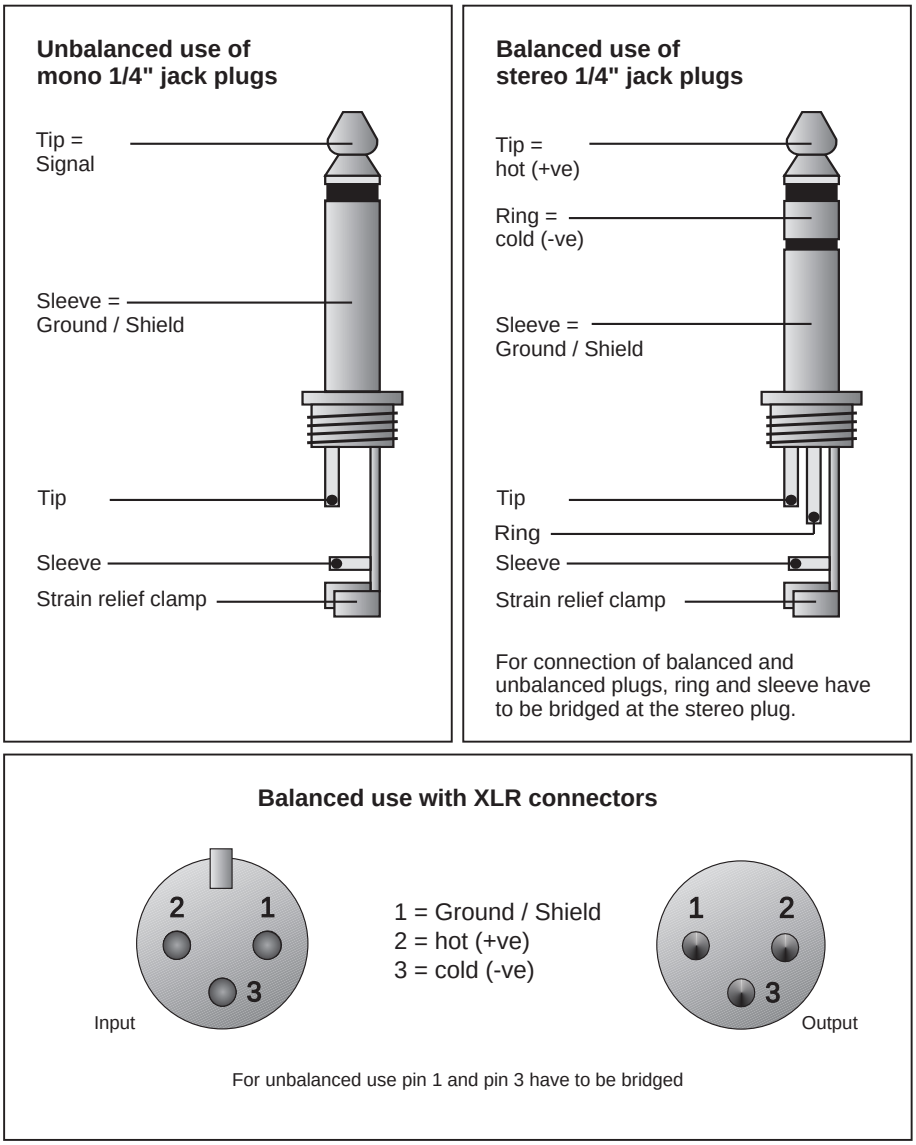

Fig. 3.2: Different plug types

☞ **Never use unbalanced XLR connections with microphone cables, as this would short-circuit any phantom power transmitted over these cables!**

3.4 Selecting the operating level

With the “Operating Level“ switch on the rear of the Behringer COMPOSER PRO you can adjust the internal operating level of the unit. Thus, the COMPOSER PRO can be adapted perfectly to various levels (e.g. both the typical home recording level of -10 dBV and the professional level of +4 dBu). The level meters are referenced automatically to the selected level, i.e. an optimum operating range of the meters will always be ensured.

4. CONTROLS

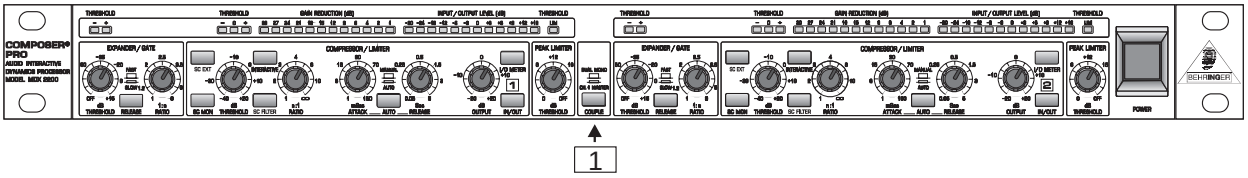

Fig. 4.1: COMPOSER PRO front panel

The Behringer COMPOSER PRO has two identical channels. Each channel is equipped with 8 backlit push-buttons, 8 rotary controls and 30 LED's. The COUPLE switch is for stereo operation:

1 The COMPOSER PRO converts to stereo mode by engaging the COUPLE switch, where the left channel assumes the control of both audio channels, i.e. the control signal of channel 2 is replaced with that of channel 1. By pressing the COUPLE switch, you override all the controls and switches of channel 2 with the exception of the IN/OUT, SC MON, SC EXT and SC Filter switches as well as the PEAK LIMITER control. The controls of channel 1 take over all functions of channel 2.

4.1 Expander/Gate Section

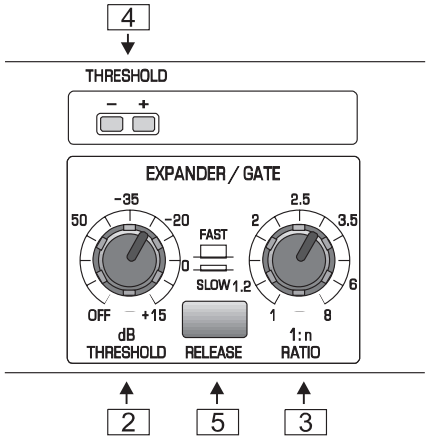

Fig. 4.2: Control elements of expander/gate section

2 Use the THRESHOLD control to determine the threshold point below which expansion occurs. The range of this control is from OFF to +15 dB.

3 The RATIO control is used to adjust the expansion ratio when the signal drops below the threshold value. This control determines whether the unit works as an expander (low ratio level) or as a gate (1:8). The expansion ratio can be set from 1:1 to 1:8.

4 When a signal below the threshold value is applied, the"+" LED lights up, while the"-"-LED lights up when expansion occurs.

5 To optimally adapt the expander/gate to the program material, the RELEASE switch allows for selecting a SLOW or FAST release time. When you engage this switch, the expander responds with a slow release. As a general rule, percussive material with little or no ambience is processed using the FAST release mode, whereas signals with long decay or with heavy ambience require the SLOW release mode.

4.2 Compressor Section

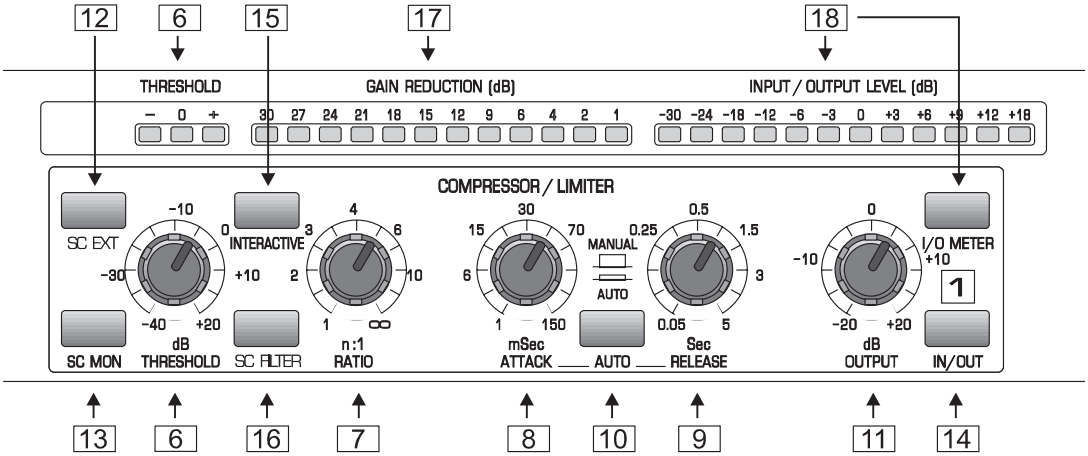

Fig. 4.3: Control elements of the compressor section

6 The THRESHOLD control sets the threshold point for the compressor section. It has a range of -40 to +20 dB. The “Soft Knee“ characteristic is applied to the signal exceeding the threshold point by a maximum of 10 dB. Above 10 dB, the signal would experience “Hard Knee“ compression. The THRESHOLD-LEDs show the actual state of the input signal relative to the THRESHOLD setting. The IKA-“Soft Knee“ range is indicated by the middle yellow LED.

7 The RATIO control determines the ratio between the input and output level for all signals exceeding the threshold point by more than 10 dB. The control range can be adjusted from 1:1 to ∞:1.

8 The ATTACK control determines the rate by which the compressor responds to the signal which exceeds the threshold. This control can be adjusted from 1 to 150 milliseconds.

9 The RELEASE control determines the rate that the compressor returns to unity gain after falling below the threshold level. This control can be adjusted from 0.05 to 5 seconds.

10 By activating the AUTO switch, the ATTACK and RELEASE controls are disabled and the attack and release rates are automatically derived from the programme material. This function allows for unobtrusive musical compression of signals or mixes with widely varying dynamics. Only if set to “MANUAL“ will the settings of the attack and release controls function.

11 The OUTPUT control allows for the increase or decrease of the output signal by a maximum of 20 dB. Thus, a level loss due to the compression or limiting process can be compensated for.

☞ Please note when using the THRESHOLD control of the Peak Limiter section, that the OUTPUT control of the Compressor section precedes the Peak Limiter section. If the OUTPUT control is set too high, this can result in continuous peak limiting (see item 19 “THRESHOLD control“).

12 When activated, the SC EXT switch severs the connection between the audio input and the sidechain path, whilst at the same time allowing an external signal to be sourced at the SC RETURN jack on the rear panel.

13 Using the SC MON switch will enable you to connect the sidechain control signal to the audio output, whilst at the same time muting the audio input. This function provides you with the ability to monitor the sidechain signal that is returned via inserted equalizers or other external processors. The SC MONITOR function will assist you with tuning equalizer parameters for example.

☞ Please note when the SC MON switch is engaged, the audio processing facility of the respective channel is disabled. When this function is active, a visual indication will be provided by the switches LED, which will blink.

14 The IN/OUT switch activates the relay and hence the corresponding channel. This switch acts as a so-called “hard-bypass“ relay, which means that when the switch is OUT or when the unit is disconnected from the mains, the input jack is directly linked to the output jack. Normally, this switch is used to perform a direct A/B comparison between the unprocessed and the compressed or limited signals.

15 Press the INTERACTIVE switch to change from “hard knee“ to IKA characteristics. IKA provides a very subtle and musical compression of the program material and should therefore be used whenever compression should be more or less inaudible.

16 The SC FILTER switch activates a high-pass filter in the side-chain path and thus limits the influence of low frequencies on the COMPOSER PRO’s control processes.

17 The 12-digit GAIN REDUCTION meter indicates how effectively the gain is reduced by the compressor, within a range from 1 to 30 dB.

18 The 12-digit INPUT/OUTPUT LEVEL meter informs you - depending on the setting of the I/O METER switch - about the current input or output level, within a range from -30 to +18 dB. When the switch is set to IN (not engaged), the meter reads the input level, when it is OUT, the output level is displayed. The meter is referenced to the operating level (-10 dBV or +4 dBu) adjusted with the OPERATING LEVEL switch.

4.3 Peak Limiter Section

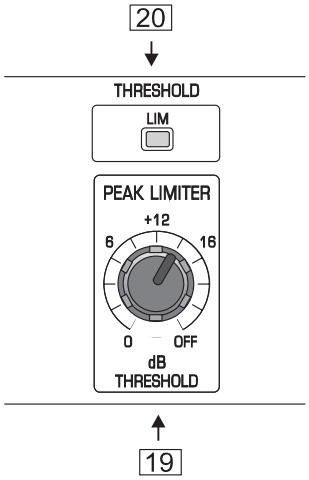

Fig. 4.4: Control elements of the peak limiter section

19 The peak limiter limits the signal to a level adjusted with the THRESHOLD control. Owing to its extremely fast response (“Zero“ attack), the limiter is capable of limiting signal peaks without audible distortion. Whenever the signal is limited for more than 20 ms, the overall level is reduced for about 1 second to avoid heavy and thus audible signal distortion.

☞ When you use the peak limiter as a protective device against signal peaks, the THRESHOLD control should be set in combination with the OUTPUT control in the Compressor section so that the peak limiter responds rarely or not at all. Thus, only real signal peaks will activate the limiter circuit. However, to produce creative sound effects, the peak limiter can be deliberately set to lower levels.

20 The LIM LED lights up as soon as the limiter function is activated.

4.4 Rear-panel control elements of the COMPOSER PRO

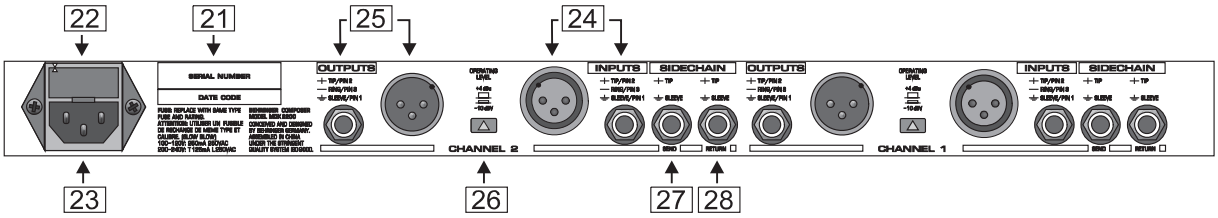

Fig. 4.5: Control elements of the rear panel

21 SERIAL NUMBER. Please take the time to have the warranty card filled out completely by your specialized dealer, and return it within 14 days after the date of purchase, so as to be entitled to benefit from our extended warranty.

22 FUSE HOLDER / VOLTAGE SELECTOR. Please make sure that your local voltage matches the voltage indicated on the unit, before you attempt to connect and operate the COMPOSER PRO. Blown fuses may only be replaced by fuses of the same type and rating.

23 MAINS CONNECTION. Use the enclosed power cord to connect the unit to the mains. Please also note the instructions given in the “INSTALLATION“ chapter.

24 AUDIO IN. These are the audio inputs of your COMPOSER PRO, available both as balanced 6.3 mm jack and XLR connectors.

25 AUDIO OUT. These are the audio outputs of your COMPOSER PRO. Matching phone jack and XLR connectors are wired in parallel. These outputs can be transformer-balanced by retrofitting the optional output transformer OT-1.

26 With the OPERATING LEVEL switch you can adapt the COMPOSER PRO to various operating levels, i.e. you can select both the -10 dBV home recording level and the professional studio level of +4 dBu. The level meters are referenced automatically to the selected level, i.e. an optimum operating range of the meters will always be ensured.

27 SC SEND. This is the unbalanced side-chain output which allows for routing the audio signal to external processing devices.

28 SC RETURN. This is the unbalanced side-chain input used to return any external or processed control signal.

5. APPLICATIONS

In this section, several typical applications of the Behringer COMPOSER PRO are discussed. The following basic settings can resolve most dynamic problems. They are the ideal starting point. Please take the time to study the application examples carefully, in order to be able to make full use of the COMPOSER PROs capabilities in the future.

Main Applications And Initial Settings

The main applications of the Behringer COMPOSER PRO can be divided into three categories: The Expander/ Gate section is used to eliminate interference and to suppress background noise and leakage on individual tracks in multitrack recording. The Compressor section is used to compress the program material and to create special effects and unusual sounds, which are used for recording and musical performance. The subsequent Peak Limiter section is designed to protect loudspeakers, tape recorders, transmitters etc. from being overloaded.

5.1 Compression/Levelling/Limiting/Clipping

Now that the functions of the individual sections have been clearly explained, we would like to acquaint you with more terms and relationships of the dynamics process.

Compression

A compressor converts a large dynamic level into a restricted range. The extent of the resulting dynamic level is dependent on the threshold, attack, release and ratio settings. As it is the desired effect of a compressor to increase a low level signal, generally the threshold is set low. The “inaudible“ compression mode requires fast attack and release times and low ratios. The faster the chosen control times and the higher the compression ratio, the greater the effect on the short term dynamics. This fact is often used to achieve audible and creative sound effects.

Levelling

The levelling mode is used to keep output level constant, i.e. to compensate for long term gain changes, without affecting the short term dynamics. Normally, the threshold is set quite low in order to be able to increase low level signals. Levelling requires slow attack and release times, combined with a high ratio. Because of the very slow response time, levelling has no effect on signal peaks or short term changes in average level.

Limiting

The limiting function requires a fast attack time and a high ratio and release time setting, which is dependent on the specific use and the desired sound effect. As it is usually the task of a limiter to limit only high signal peaks, the threshold is usually set at a high level. The dynamics are reduced dependent on the ratio setting and the degree by which the threshold point was exceeded. If the attack time is adjusted to control only the average level without affecting signal peaks above the threshold, this is referred to as the program limiter. For this purpose the attack time will be set above 20 ms. If the attack time is further reduced in order to also control signal peaks, this is defined as the peak limiter.

Clipping

In contrast to the two previously mentioned limiters, the clipping mode features infinitely fast control times, an infinite compression ratio and creates an unsurpassable barrier (“brickwall“) for all signals above a certain level. To be able to control the signal peaks, the clipping function radically cuts signals above the threshold, without affecting the amplitude of the original signal. If used in normal applications, this function remains inaudible and under certain circumstances it can even lead to an improved sound, because cutting the transients creates artificial harmonics. If misused, clipping can cause very obvious and distasteful distortion, which in an extreme manner, will convert the signal’s waveform into a square wave signal. This effect is often produced in guitar distortion devices (“fuzz boxes“).

5.2 Expander/Gate Section

The main task of the Expander/Gate is to “inaudibly“ eliminate undesirable background noise from the usable signal. As already described in chapter 1.1.3, a downward expander automatically reduces the overall level

for all signals below an adjustable threshold. The expander therefore operates in opposite way to that of a compressor/limiter. Expanders generally function with a flat ratio curve, so that the signal continually fades. Noise-gates however, can be seen as “high ratio“ expanders. If the signal falls below the threshold, it is radically attenuated.

The Behringer COMPOSER PRO is equipped with a newly developed IRC (Interactive Ratio Control) Expander, the ratio of which is automatically adjusted dependent on the program material. The response characteristics of conventional expanders tend to cut into the signal abruptly and the result of this is unacceptable most of the time. Gain changes become audible.

The IRC Expander is therefore equipped with a soft, interactive non-linear ratio curve, which is best suited to human hearing. Critical signals in the vicinity of the threshold level are processed with a minute expansion ratio, whereas signals that reduce in level will be subjected to an increasingly higher ratio, which will result in greater attenuation.

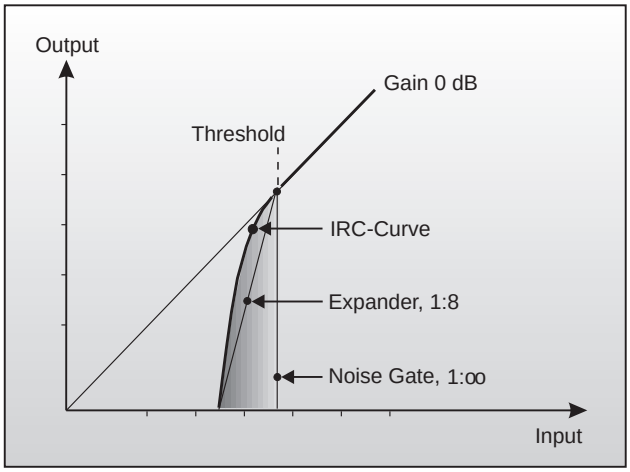

Fig. 5.1: IRC curve characteristic of the Expander

The result is expansion, which is less critical to adjust and which is more tolerant of useable signals, whose level is slightly above that of the noise floor. Expansion therefore occurs extremely “soft“ with low ratio settings, while the known negative effects of expansion are inaudible. The Attack time of the IRC expander is set automatically and program-dependent, i.e. extremely short for quickly changing signals and slower for a more balanced program material. Since the expander/gate adapts itself automatically to the program material, you will note that the new IRC (Interactive Ratio Control) circuit produces considerably better results than conventional expanders.

5.2.1 Controlling Leakage In The Studio

Expander/gates are most commonly used to suppress undesirable leakage of sound from one track to another during recording or playback. They are usually used when recording drum kits, where the mics are very close to each other. High volume levels of individual instruments often cause considerable leakage onto all the adjacent mics and results in conflicting frequency and phase coherence problems, as well as unspecified sounds (“comb“ filter effects). It is vitally important that every instrument is recorded into a separate mic and that each mic is individually gated.

Patch the Behringer COMPOSER PRO into a snare drum channel for example and adjust it so that triggering only occurs on snare hits. Each mic should be set to its maximum operating level, monitored (see SC MON switch) and the THRESHOLD level set so that each snare hit sounds acoustically clean and seperate, as though it was played on its own.

The optimum use of the Expander/Gate depends principally on microphone technique. Be particularly careful, when high frequency instruments are located to the side or rear of a cardioid microphone. Most cardioids exhibit a sharply rising off-axis response characteristic at higher frequencies. If there is only a 2 or 3 dB difference between the on-axis and off-axis response in the 5 to 10 kHz region, cymbals may leak excessively into the tom mics and you may have hi-hat spilling all over the snare mic.

Please make full use of the directional characteristic of the mics, to acoustically exclude all other instruments

as much as possible. Make sure that you do everything possible to achieve source separation with good microphone technique. Otherwise the Expander/Gate is not able to undertake clear acoustic separation.

Sometimes, it is necessary to prevent the Expander/Gate from responding to low frequencies (rumbles etc.), especially if a singer is moving the microphone around on a mic-stand. More information about this topic in chapter 7.2 “THE USE OF AN EQUALIZER IN THE SIDECHAIN PATH“.

5.2.2 Initial Settings For The Expander/Gate Section

Control	Setting
THRESHOLD control	OFF
RELEASE switch	SLOW
RATIO control	1:2

Tab. 5.1: Initial settings for the expander/gate section

Begin with very low threshold levels, so that the signal can pass through the unit unaffected. Now turn the control clockwise until all unwanted noise is removed and only the sound of the desired instrument can be heard.

To adapt the unit to the program material properly, you can additionally choose between a SLOW or FAST release time. In the depressed position, the unit works at a slow release time. Percussive material with little or no reverb, is processed in fast mode, whereas the slow mode is advantageously used for signals with long durations or signals with heavy ambience. You will find that a fast release time (FAST mode) is preferable for acoustic separation of most percussive sounds, whilst cymbals and tom toms, normally benefit from the SLOW mode.

The RATIO control determines the ratio between input and output level, for all signals below the selected point of threshold. Use this control to determine whether the section works as an expander or as a gate (Ratio 1:8).

If the controls are set correctly, the drum sounds will be “dry“, “sharp“ and clearly defined. If you do not have enough mics (or COMPOSER PRO channels!) to record each instrument separately, try to create sub-groups: put the snare and mid-toms together, and group the side-toms, bass drum and cymbals together with the help of a mixing console.

The aim is to set up the Expander/Gate and to position the group mics so that each strike on an instrument opens a specific mic and so only that instrument is recorded, whilst the other mics remain “muted“.

5.2.3 Reducing Leakage In Stage Mics

The COMPOSER PRO has many uses in live-work, on stage and in multi-miking situations: a well set up Expander/Gate can effectively suppress background noise, compressor type pumping noise and microphone leakage etc. without producing any undesirable side effects. Expander/gates are commonly used for processing vocals. When specifically used with a compressor, the distance and position of the mic in relation to the singer is very critical: the further the distance, the more sensitive the mic is to background noise. Use the Expander/Gate section in the slow release mode to “inaudibly“ eliminate background noise, that occurs in pauses between singing. When used in live situations, leakage of miked instrumentation is substantially reduced, as well as other acoustic contaminants in various recording situations.

5.2.4 Reducing Feedback In Stage Mics

When a singer is using a vocal mic, their voice effectively stops other sounds from entering the mic. But in pauses between the singing, the mic will pick up noise from the house PA and monitors, which can lead to unpleasant feedback problems. If the COMPOSER PRO is inserted into the mic channel, it will shut off the channel when it is not being used, reducing the possibility of feedback. Principally all mics should be included in this application.

5.2.5 Noise Reduction On Effects Paths

The effects rack is one of the main overlooked sources of noise in a PA system or recording facility. The price of reverb and delay units and harmonizers has fallen drastically over the last number of years, which have made these units a common feature in small studios and home recording installations. However, multiple effects units considerably increase the overall noise level, so that the pleasure in acquiring a new sound effect is short lived.

It will prove useful to use the Behringer COMPOSER PRO as the last component in the chain of effects units and use the noise reduction function of the Expander/Gate section. We recommend that you use a slow release time in order to maintain the natural reverb.

5.2.6 Creative Use Of The Expander/Gate Section

In addition to the previously explained applications, the Expander/Gate can be used to change the sound characteristics. For example, the quality of ambience or reverberation created by an instrument within a room can be modified: when an instrument stops decaying, the reverberation of the instrument falls below the user-defined threshold. The reverberation can be controlled by using the THRESHOLD control and the RELEASE switch. The decay characteristics of the instrument can be controlled using the release switch, so that the natural characteristics of the instrument remains. Experiment with the effect, this control has on the decay of the instrument. In SLOW mode, the signal is gently faded out - in FAST mode, the duration of the reverberation can be removed completely.

5.3 Compressor Section

The task of a compressor is to reduce the dynamic range of program material and to control the overall level. The extensive controls of the Compressor section, provide a great range of dynamic effects: from musical and soft compression to limiting signal peaks, right up to extreme and effective compression of the overall dynamics. For example, a low ratio and very low threshold setting can be used to achieve soft and musical processing of the general dynamics of the program material.

Higher ratios, together with low threshold settings, create relatively constant volume (levelling) for instruments and vocals. High threshold levels generally limit the overall level of a program. Ratios greater than 6:1 effectively prevent the output level from significantly exceeding the threshold point (provided that the OUTPUT control is in the 0 dB position).

Please note that the compression of the entire program material (achieved by low threshold settings) sounds less natural with higher ratio settings. Ratio settings in the range of 4:1 and lower, effect the dynamics of the program material less and are often used to compress the sound of a bass guitar, a snare drum or a vocal. Sensitive and moderate settings are generally used in mixing and for levelling of program material in broadcast.

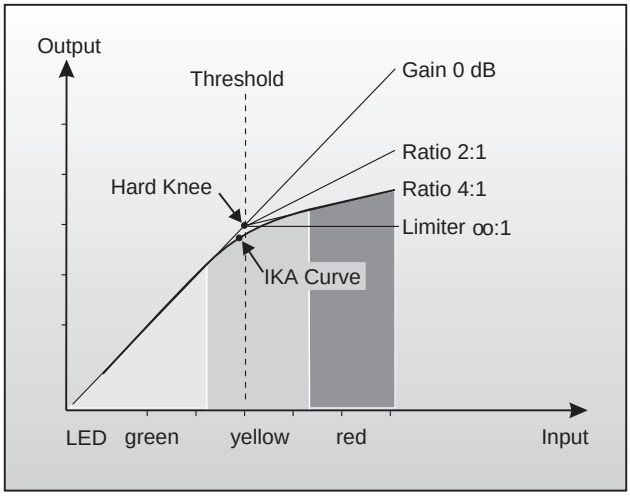

Fig. 5.2: IKA characteristic of the compressor section

The new IKA (Interactive Knee Adaption) circuit prevents aggressive compression, created by high ratios, from sounding too unnatural. This is achieved with an interactive control function, which begins above the threshold level and introduces a “Soft Knee“ curve characteristic in the range up to 10 dB above the threshold point. Beyond this range, the signal is subjected to linear (“Hard Knee“) compression.

☞ With the threshold control completely turned to the right, the threshold value is +20 dB. Since such a value will not be reached in practice, you can use it to disable the compressor section and work exclusively with the expander/gate and limiter circuits.

5.3.1 Initial Settings For The Compressor Section

Control	Setting
IN/OUT switch	IN
SC EXT switch	OUT
SC MON switch	OUT
INTERACTIVE switch	IN
SC FILTER switch	OUT
THRESHOLD control	+20 dB
RATIO control	3:1
AUTO switch	IN
OUTPUT control	0 dB

Tab. 5.2: Initial settings for the compressor section

Rotate the THRESHOLD control counterclockwise until an appropriate amount of gain reduction is indicated on the GAIN REDUCTION meter. This operation will be accompanied by an audible drop in output level. The OUTPUT control should now be turned clockwise to reinstate the output level. The level of the unprocessed and the processed signal can be compared by pressing the I/O METER switch and observing the INPUT/ OUTPUT LEVEL meter.

Final adjustments of the controls can then be made to suit your particular requirements, including the RATIO, ATTACK and RELEASE controls. The AUTO function of the attack and release times, provides program dependent dynamic processing which suits most standard uses. If a “condensed“ or “wider“ sound processing technique is required, the attack and release times can also be manually adjusted.

The experienced user will be in a position to specify parameters while in bypass mode and thus realize the effect before the unit is actually switched into operation. This is important in live situations, where a signal needs to be managed efficiently by the engineer, without the convenience of continual A/B comparison.

5.3.2 The COMPOSER PRO As A Sound Effects Unit

In the early 1960’s, musicians began looking at the recording process as a way to create new sounds. The pumping effect which had been avoided by earlier engineers suddenly became fashionable and was utilized as a creative tool, laying the groundwork for many of the sounds which are now considered indispensable in contemporary music. The compressor is used in this role because you can hear it working, and control of the dynamic range is of secondary importance.

The Behringer COMPOSER PRO, with its extensive range of functions, is well suited to this application. Sound effects of this kind can be achieved using “extreme“ settings. To achieve this, set the THRESHOLD control to a fairly low level, the RATIO control to almost maximum and use the ATTACK and RELEASE controls to obtain the desired effect. Experiment with all the controls in order to get a feel of their function!

5.3.3 The “Muffling“ Effect Of A Compressor

Quite often, compressors are sometimes accused of “muffling“ the sound, whilst at the same time reducing the dynamics. This fact should be investigated further. Bass frequencies contain most of the energy within music and therefore cause the compressor to reduce the overall dynamics. If the music also contains high frequencies along with the bass frequencies, these are also reduced in level. This is the reason why: in an extremely compressed recording of drums, the cymbals and high-hats are acoustically swamped by the sound of the snare or the bass drum. The same effect is experienced when processing reverberated or ambient sounds. The solution commonly used to this basic problem is either to reduce the compression ratio or to slow down the attack time, so that the increasing high frequency transients pass through the compressor unhindered before the compressor takes effect.

The COMPOSER PRO MDX2200 offers a solution to this problem that is by much more elegant. The SC Filter switch allows you to activate a high-pass filter in the control signal path of the compressor. This filter makes sure that midrange and treble range frequencies are taken into account to a greater extent, and that a low-frequency signal triggers less compression than a midrange/treble signal of comparable level. A major advantage of this design can be seen in the fact that the frequency response of the overall signal is not modified below the threshold adjusted with the Threshold control.

In pop music the dynamics of both kick drum and bass guitar are usually processed individually. The side-chain filter is therefore ideally suited to apply overall compression in the mix-down, to compress the music while increasing its loudness, but without having to accept the drawbacks described above.

Please note that we offer a whole series of high-grade equalizers and enhancers/exciters, which are perfect tools to give any dynamics-processed signal the finishing acoustic touch. Please ask for detailed information!

5.4 Peak Limiter section

As a section of its own and independent of the remaining control functions, the peak limiter enables you to limit the maximum peak level on the COMPOSER PRO’s output. It has been designed for use in combination with the compressor section. Independently of all compressor functions, you can protect subsequent devices against signal peaks, short-time overload and excess modulation (radio stations, etc.).

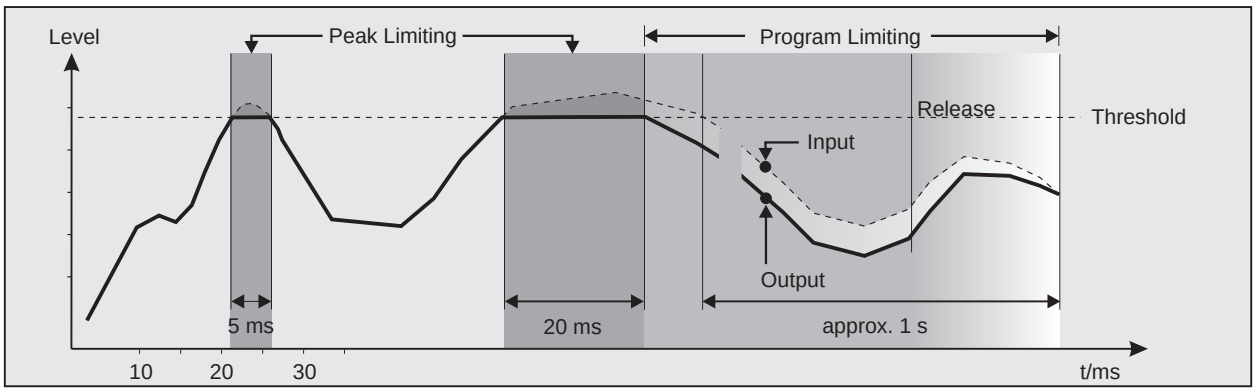

Fig. 5.3: IGC characteristic of the limiter section

The diagram illustrates the functioning of the IGC limiter. The solid graph represents the output signal, while the dashed graph above shows the input signal response. The areas between the graphs represent the amount of gain reduction (bright areas are “clipping areas“, i.e. signal peaks are radically cut off, dark areas show the effect of the program limiter). The limiter is activated when the adjusted threshold is exceeded for more than 20 ms, so as to limit audible clipping to a very short moment. About 1 s after the signals has dropped below the threshold again, the reduction is set to 0 dB, so that input and output signals are identical again (unity gain).

5.4.1 Initial Settings For The Peak Limiter Section

Control	Setting
THRESHOLD control	OFF

Tab. 5.3: Initial settings for the peak limiter section

The THRESHOLD control of the Peak Limiter sets the threshold level, so that subsequent units are protected from overloading. If the LIM comes on regularly or is on constantly, the OUTPUT control of the Compressor section must be turned down, as this control sets the level of the signal, which is routed to the Peak Limiter section.

If this technique leads to an undesired drop in the overall level, it is recommended that you increase the compression: either, reduce the threshold level, or increase the compression ratio with the RATIO control. The OUTPUT control will compensate for a renewed drop in level.

6. SPECIAL APPLICATIONS

6.1 Using the COMPOSER PRO for recording and cassette duplication

In the recording and duplication field the goal should always be to achieve an optimum recording level onto the recording media. Too low or too high recording levels lead to side effects such as noise, distortion etc. In mastering and multitrack recording, as well as in duplication, one should always take care to utilize the full dynamic range of the tape recorder, DAT recorder etc. Principally, it is possible to control the recording level by "riding" faders, which means with low level signals, the gain is increased, whereas the amplitude of high level signal is reduced. It is obvious that this method is insufficient because, especially in live recordings, the expected signal levels cannot be anticipated correctly. Especially with multitrack recordings, which are run under hectic circumstances, the signal level of all channels cannot be monitored and controlled at the same time. Generally, with manual control, it is not possible to achieve satisfying recording results.

An automatic gain control system achieves better and more constant results. Use the COMPOSER PRO by starting with the initial settings, and use its dynamic control functions in order to be able to drive an analogue, as well as a digital recording, up to the limit of its maximum dynamic range while remaining noise- and distortion-free.

6.1.1 The COMPOSER PRO In Digital Recording And Sampling

In an analogue recording, too low recording levels lead to an increased noise level, whereas too high levels will cause a compressed and "squashed" sound. In extreme cases, it will cause distortion due to tape saturation. In contrast to analogue, side effects in the digital field always become extremely audible: with decreasing level, a tape previously recorded with insufficient level loses resolution: the recording sounds "hard" and loses "atmosphere". With excessive level, the recording sounds harsh and heavily distorted. In order to avoid these effects, the Peak Limiter section of the COMPOSER PRO should be placed before for example a sampler. As a result of this process, a digital recording or a sampling event can be optimally set in level without any problem.

6.1.2 The COMPOSER PRO In Mastering

The mastering process is one of the most critical processing steps in recording. In this production step, it is the goal to achieve a "maximum level" copy of the recording, without any noise or distortion. In many applications it is further required to produce a high average volume. In the field of commercial media for example, this is apparent especially with records and cassettes which are processed with high average volumes. Quite often in these cases, dynamics suffer drastically, because the program material has been compressed and limited too heavily. Using the Compressor and the Peak Limiter section of the COMPOSER PRO allows you to drastically increase the overall volume, without audibly affecting the dynamics.

Proceed as follows:

1. Limit the dynamics of the program material by 6 dB using the Peak Limiter section. By softly clipping just the transients, the real audio signal will not be limited, resulting in a higher headroom. The overall gain can now be increased by 6 dB, which leads to a higher volume. More than 6 dB should not be limited, otherwise side effects could become audible.
2. Therefore, in addition, you should also use compression. It is recommended that the compression is limited to the "first" 6 dB of the dynamic range only. A high threshold level in addition to the auto mode will give good results.

This effect is particularly noticeable with DAT recorders, whose level indicators achieve a response time of less than 1 ms. Set the DAT recorder at unity and now reduce the LEVEL control of the peak limiter until the LIM LED starts to illuminate. The "cut" signal peaks cause a reduced recording level of about 6 dB, which is visible on the level indicators of the DAT recorder. Now increase the recording level of the recorder back to unity. The result is a clearly louder recording without any loss of sound.

6.2 The COMPOSER PRO as a protective device

Sound system distortion is usually a result of amplifiers and loudspeakers being driven beyond their limitations by signals clipping. The signal limitations that occur lead to unpleasant distortion that is dangerous to the speakers.

A speaker diaphragm is required to accelerate, slow down, smoothly change direction and accelerate again in normal operation. Distorted operation (clipping) leads to instant acceleration, instant stop, change of direction and instant acceleration again. Since speaker diaphragms are subject to the laws of physics, they will not take this kind of punishment for long: the diaphragm will either break up or its voice coil may overheat.

In addition to the damage caused by sustained overload, the speaker may also be damaged by an occasional high level overload, e.g. the sound of a microphone falling onto a hard floor. Even if this type of transient does not destroy a speaker outright, it may damage the speaker surround in such a way, as to cause mechanical abrasion and future failure. It is recommended that you use the Behringer COMPOSER PRO in order to protect the speaker. “Brick Wall“ peak limiters are not normally necessary for PA systems, as amplifiers and loudspeakers are tolerant of short signal peaks.

Nevertheless, conventional limiters have to be generally driven far beyond the headroom limit of an amplifier, in order to limit the level and length of the transients responsible for overloading the system. The disadvantage of this principle is that the unit’s full range cannot be completely used. If an increase in the average level of up to 3 dB is attained with the COMPOSER PROs IGC Peak Limiter, this means that you effectively double the power amplification. The COMPOSER PRO can act in this way to convert a PA system of 5,000 Watts into a distortion free 10,000 Watts system. The following instructions will help you to integrate the unit into your system.

6.2.1 Protection Of A System With A Passive Crossover

If your sound system incorporates a passive crossover network (included in the loudspeaker case), insert the Behringer COMPOSER PRO between your mixing console output and the power amplifier input. It is used as the last link in the chain preceding the power amp. Thus, you can effectively avoid the “technical knockout“ of the midrange/tweeter range caused by high-energy bass signals! This statement, as paradox as it may seem at first, can be explained with the fact that especially low-frequency signals with high amplitudes can overload the power supplies in the amplifier(s). The resulting clipping (cutting off of signal peaks) produces high-energy distortion (upper harmonics), which is abruptly added to the midrange/tweeter signals. For this reason, “weak“ power amps, in particular, must be protected by a limiter in their “input dynamics“.

6.2.2 Protection Of A System With An Active Crossover

For systems using active crossovers, there are two ways to use the Behringer COMPOSER PRO. The unit may be inserted between the console output and the crossover input. In this application, the Behringer COMPOSER PRO will process the entire audio frequency spectrum.

Alternately, the Behringer COMPOSER PRO can be inserted between the output of an active crossover and the input of a power amplifier. In this application it will only affect a specific range of frequencies. This application is particularly suited to protect the most fragile components of a multi-way speaker system against harmful signal peaks. For example, when your tweeters keep on going up in smoke all the time, the entire system should be operated at lower sound pressure levels or the tweeters should be replaced by other models. Using the COMPOSER PRO in the corresponding tweeter band avoids overloading and thus damage to the speakers.

6.2.3 Improving The Sound Of A Processor System

A processor system is understood as a PA system which contains a special active crossover whose outputs are linked via separated power amplifiers to the loudspeakers. Each band has its own limiter whose task it is to limit dangerous signal peaks to a certain level. This process avoids overloading the subsequent power amplifier or destruction of the loudspeaker.

In some units, the crossover frequencies in the crossover unit are further changed during high signal levels to achieve a “loudness contour“ suited to the human hearing. But in many cases, this function leads more to a disturbance than to an improvement of the sound quality.

If the COMPOSER PRO is preceding this system, the signal peaks can be eliminated before they reach the limiters of the processing system. The sound quality therefore remains natural and free of side effects caused by the changing frequencies of the crossover.

6.4 The COMPOSER PRO in broadcast

The main aim of processing sound recordings for commercial radio and television is to achieve a maximum transmission volume at all costs. Owners of these radio and television stations strive to get bigger audience ratings, because principally, radio programs whose reception is louder than the average are preferred by the listener. By achieving a bigger audience, the broadcast station gains more money from the increasing number of promotion companies placing adverts.

What is volume?

Volume is defined as the relationship between the average level of program material to peak-to-peak level, in response to amplitude and duration. The higher the average level and the time it remains at a high level, the louder the program material will be perceived by the listener.

If you want to run your broadcast station at maximum average volume, proceed as mentioned in chapter 6.1.2 “The COMPOSER PRO In Mastering“. Please make sure that the maximum peak level is below the threshold of the transmitter’s limiter, otherwise this could lead to very hard and audible use of the transmisson limiters. Keep in mind that a heavy increase in average volume by means of compression always leads to a loss in dynamics and an increased perception of side effects. The moderate use of the Compressor and the Peak Limiter sections of the COMPOSER PRO result in higher average volumes, free of distortion.

7. EXTERNAL SIDECHAIN APPLICATIONS

7.1 The Sidechain Function

The Behringer COMPOSER PRO offers an exceptionally usable external facility by using the sidechain function. By activating the SC EXT switch, the COMPOSER PROs control path is disconnected from the audio input and therefore interrupted. The audio input is routed to the SC SEND output and the SC RETURN input now receives the new control signal which is derived from an inserted effects processor.

Please note the correct wiring for mains powered units in order to avoid ground loops, as the sidechain inputs and outputs are unbalanced. The working level of external units must be at line level (-20 to +10 dBu) and must be at unity gain.

7.2 Using An Equalizer In The Sidechain Path

It is very common to make the response threshold of a compressor frequency-dependent, where a graphic or parametric equalizer is connected to the sidechain path. To retain the threshold setting of the COMPOSER PRO, unwanted frequencies should be reduced by an equalizer and the desired frequencies should be kept at the same level. Should for example, the compressor be controlled by a narrow mid-frequency band, it is advisable to lower the bass and treble controls. The middle frequency control remains at unity gain.

7.2.1 The COMPOSER PRO As A “De-Esser“

“De-essing“ is a special application of frequency selective compression. A problem often encountered in recording, is the sibilant (Ssss) sound of the human voice. High frequency, sibilant sounds and pops can produce very high energy levels which can sometimes cause an otherwise normal and undistorted voice to sound very harsh, shrill and sometimes unintelligible. The solution is frequency conscious compression or limiting. The unit responds only to selected frequencies and reduces the level temporarily, as soon assibilant sounds or pops are detected.

If the detector circuit registers an excessive amount of high frequency information within the program material, as in a normal compressor, the VCA is activated and the overall level is reduced. As this type of compression affects the whole frequency range, this process is called broadband de-essing.

Please note that this type of frequency selective compression is very different from simple, fixed equalisation using notch filters, since de-essing has no effect on the signal except at the instant the sibilant occurs. The general frequency response is principally not affected during this process.

When de-essing, simply insert an equalizer not into the audio path but into the sidechain path of the Behringer COMPOSER PRO. The equalizer is inserted between the SC SEND output and the SC RETURN input of the Behringer COMPOSER PRO. While the SC EXT switch is depressed, the equalizer is inserted into the sidechain loop and controls the unit. With the help of the sidechain monitor function, the centre frequencies of the equalizer are then adjusted exactly to match the frequencies of the sibilant sounds. All other frequencies are filtered out, so that with maximum attenuation of these frequency bands, along with a correctly adjusted threshold point, the unit responds solely to the selected signal being produced by the equalizer. The level of the sibilant sounds can therefore be effectively limited.

Control	Setting
SC EXT switch	IN
SC MON switch	OUT
INTERACTIVE switch	OFF
SC FILTER switch	OUT
THRESHOLD control	+20 dB
RATIO control:	1:4
AUTO switch	OUT
ATTACK control	1 ms
RELEASE control	150 ms
OUTPUT control	0 dB

Tab. 7.1: Initial settings for the De-Esser functions

Turn the THRESHOLD control anticlockwise until the GAIN REDUCTION meter shows an appropriate drop in level. Now press the SC MON switch and adjust the equalizer corner frequencies (generally 6 - 10 kHz) by monitoring, until it is within the range of the sibilance. Release the SC MON switch and recalibrate the THRESHOLD control, so that the unit reacts only when the sibilant sound occurs.

Level compensation using the OUTPUT control is not necessary. Although the recommended attack and release times for this function are proven, the time parameters can be adjusted if necessary to achieve maximum results. The AUTO function should not be used.

7.2.2 Frequency Selective Filtering Of Unwanted Signals

Based on the set-up described in the de-esser section, the unit may also be used to eliminate rumble, hum and equipment noise (air-conditioning systems, camera noise etc.). Using the SC MON switch, adjust the frequencies of the equalizer to match the unwanted frequencies and use a peak filter with a high slope. Take care to decrease the amplitudes of the unrequired frequencies. Proceed now as described in the previous chapter 7.2.1 “The COMPOSER PRO As A De-Esser“. This will result in compression of the selected frequencies and thus a decrease in the gain of the program material.

7.2.3 Suppressing Instruments During Recording

Another function of the Behringer COMPOSER PRO allows helpful correction of previously recorded material. If, for example, an excessively loud bass drum needs to be suppressed, reduce all the equalizers frequency bands above 150 Hz. This setting causes frequency specific compression, which reacts as soon as increased energy is detected in this band. By increasing the threshold level, the compression can be made to react only to loud pedal or stick actions. Generally, it can be said that relatively high threshold settings prevent the overall sound from being impaired and lead to the compression of solo instruments or very loud sounds.

7.2.4 Emphasizing Musical Instruments During Recording

On the other hand, you can use the Behringer COMPOSER PRO to bring out an instrument solo or a lead vocal in a cluttered mix. Using the SC MON switch, match the frequencies of the equalizer to the frequencies of the instruments to be emphasized and for this it is best to use a notch filter with a high slope.

Please make sure that in this application, you only reduce the amplitude of the selected frequencies. The compression results in a subjective decrease in the volume of the overall program material. Only the selected frequencies coming from the equalizer remain uncompressed and are therefore perceived as being louder. This inverse type of compression also helps to emphasize instruments during low level passages, so that they become more pronounced.

7.3 Anticipated Compression

If you feed the audio signal directly into the SC RETURN input and send the audio signal through a delay before the audio input, the Behringer COMPOSER PRO can anticipate the need for gain change. With experimentation, the effect can create a “zero“ attack time at a given frequency. Additional delay beyond this “zero“ attack time will produce a special sound effect, similar to the dynamic envelope inversion you may already be familiar with from reverse tape playback.

7.4 “Voice-Over“ Compression (“Ducking“)

The Behringer COMPOSER PRO can be used to automatically reduce music to a background level, when an announcer is speaking through a microphone. For this purpose, the Behringer COMPOSER PRO is used as an automatic fader and is controlled by the announcer’s microphone, which is connected to the SC RETURN input via a preamplifier. The music output and the announcer’s voice, are then mixed. This application is known as “voice-over“ compression or “ducking“ and is commonly used in discos, radio stations etc.

7.5 Triggering Additional Sounds From A Rhythm Track

This technique is used to give a rhythm track more “punch“. For this purpose, only the Expander/Gate section is required and the Compressor and Peak Limiter sections are switched off. The bass guitar track is connected to the audio chain of the Behringer COMPOSER PRO, while the bass drum is connected to the SC RETURN input. By activating the SC EXT switch, the bass guitar is now triggered by the bass drum.

Another application allows the sound of the bass drum to be supported or extended by other instruments (synthesizers etc.), where the bass drum is used to trigger a new sound, which is then mixed into the track.

8. SPECIFICATIONS

AUDIO INPUT

Connectors	XLR and 1/4" jack
Type	RF filtered, servo-balanced input
Impedance	50 kOhm balanced, 25 kOhm unbalanced
Nominal Operating Level	+4 dBu/-10 dBV switchable
Max. Input Level	+21 dBu balanced and unbalanced
CMRR	typ. 40 dB, >55 dB @ 1 kHz

AUDIO OUTPUT

Connectors	XLR and 1/4" jack
Type	Electronically servo-balanced output stage (optional transformer-balanced).
Impedance	60 Ohms balanced, 30 Ohm unbalanced
Max. Output Level	+21 dBu, +20 dBm balanced and unbalanced

SC INPUT

Connector	1/4" jack
Type	RF-rejecting, DC de-coupled, unbalanced input
Impedance	>10 kOhm
Max. Input Level	+24 dBu

SC OUTPUT

Connector	1/4" jack
Type	RF-rejecting, DC de-coupled, unbalanced output
Impedance	2 kOhm
Max. Output Level	+21 dBu

SYSTEM SPECIFICATIONS

Bandwidth	20 Hz to 20 kHz, +0/-0.5 dB
Frequency Response	0.35 Hz to 200 kHz, +0/-3 dB
Noise	>-95 dBu, unweighted, 22 Hz to 22 kHz
THD	0.008 % typ. @ +4 dBu, 1 kHz, Gain 1 0.04 % typ. @ +20 dBu, 1 kHz, Gain 1
IMD	0.01 % typ. SMPTE
Crosstalk	<-100 dB, 22 Hz to 22 kHz
Stereo Coupling	True RMS detection

EXPANDER/GATE SECTION

Type	IRC (Interactive Ratio Control) Expander
Threshold	variable (OFF to +15 dB)
Ratio	variable (1:1 to 1:8)
Attack	<1 ms / 50 dB, program dependent
Release	variable (SLOW: 100 ms / 1 dB, FAST: 100 ms / 100 dB)

COMPRESSOR SECTION

Type	IKA (Interactive Knee Adaption) Compressor
Threshold	variable (-40 dB to +20 dB)
Ratio	variable (1:1 to ∞:1)
Threshold characteristics	variable (Interactive or Hard Knee)
Auto characteristics	Wave Adaptive Compressor
Manual Attack Time	variable (0.5 ms / 20 dB to 100 ms / 20 dB)
Manual Release Time	variable (0.05 ms / 20 dB to 5 s / 20 dB)
Auto Attack Time	typ. 15 ms at 10 dB, 5 ms at 20 dB, 3 ms at 30 dB
Auto Release Time	program dependent, typ. 125 dB/s
Output	variable (-20 to +20 dB)

PEAK LIMITER SECTION

Type	IGC (Interactive Gain Control) Peak Limiter
Threshold	variable (+4 dB to OFF (+22 dBu))
Ratio	∞:1
Stage 1 Limiter Type	Clipper
Attack	“zero“
Release	“zero“
Stage 2 Limiter Type	Program Limiter
Attack	program dependent, typ. < 5 ms
Release	program dependent, typ. 20 dB/s

FUNCTION SWITCHES

SC EXTERN	Switches the detector section to the external SC input.
SC MON	Monitoring the external SC input, disengaging the normal audio.
INTERACTIVE	Enables the “Interactive Knee Adaption“ characteristics.
CONTOUR	Allows for frequency dependent detection.
AUTO	Enables the automatic and program dependent setting of the Attack-/Release times, disengaging the manual Attack-/Release controls.
I/O METER	Switches between input and output for the Level Meter.
IN/OUT	Relay controlled hard-bypass.
OPERATING LEVEL	Changes the internal reference level from +4 dBu to -10 dBV.
COUPLE	Linking both channels for stereo operation. Channel 1 becomes master.

INDICATORS

GAIN REDUCTION	12 element LED display: 1/2/4/6/9/12/15/18/21/24/27/30 dB
INPUT/OUTPUT LEVEL	12 element LED display: -30/-24/-18/-12/-6/0/+3/+6/+9/+12/+18 dB
Expander/Gate Threshold	2 LED for under “+“ and above “-“
Compressor Threshold	3 LEDs for under “+“, Interactive “0“ and above “+“
Peak Limiter Threshold	1 LED for Indication of Limiter function
Function switch	LED indicator for each

OPTIONS

Output Transformer	BEHRINGER transformer OT-1 refittable

POWER SUPPLY

Mains Voltages	USA/Canada	~ 120 V AC, 60 Hz
	U.K./Australia	~ 240 V AC, 50 Hz
	Europe	~ 230 V AC, 50 Hz
	General Export Model	~ 100-120 V AC, ~ 200-240 V AC, 50-60 Hz
Fuse	100-120 V AC: **250 mA (slow-blow)**	
	200-240 V AC: **125 mA (slow-blow)**	
Power Consumption	5 Watts	
Mains Connection	standard IEC receptacle	

PHYSICAL

Dimension	1 3/4" (44.5 mm)H * 19" (482.6 mm) * 8 1/2" (217 mm)
Net Weight	2.2 kg
Shipping Weight	3.4 kg

BEHRINGER is constantly striving to maintain the highest professional standards. As a result of these efforts, modifications may be made from time to time to existing products without prior notice. Specifications and appearance may differ from those listed or shown.

9. WARRANTY

§ 1 WARRANTY CARD

To be protected by this warranty, the buyer must complete and return the enclosed warranty card (signed/stamped by retail dealer) within 14 days of the date of purchase to BEHRINGER INTERNATIONAL (address see § 3). Failure to return the card in due time (date as per postmark) will void any extended warranty claims.

§ 2 WARRANTY

1. BEHRINGER INTERNATIONAL warrants the mechanical and electronic components of this product to be free of defects in material and workmanship for a period of one (1) year from the original date of purchase, in accordance with the warranty regulations described below. If any defects occur within the specified warranty period that are not caused by normal wear or inappropriate use, BEHRINGER INTERNATIONAL shall, at its sole discretion, either repair or replace the product.

2. If the warranty claim proves to be justified, the product will be returned freight prepaid by BEHRINGER INTERNATIONAL within Germany. Outside of Germany, the product will be returned at the buyer's expense.

3. Warranty claims other than those indicated above are expressly excluded.

§ 3 RETURN AUTHORIZATION NUMBER

1. To obtain warranty service, the buyer must call BEHRINGER INTERNATIONAL during normal business hours BEFORE returning the product (Tel.: +49 (0) 21 54 / 92 06 66). All inquiries must be accompanied by a description of the problem. BEHRINGER INTERNATIONAL will then issue a return authorization number.

2. The product must be returned in its original shipping carton, together with the return authorization number, to the following address:

BEHRINGER INTERNATIONAL GmbH
Service Department

Hanns-Martin-Schleyer-Str. 36-38

D - 47877 Willich-Münchheide

3. Shipments without freight prepaid will not be accepted.

§ 4 WARRANTY REGULATIONS

1. Warranty services will be furnished only if the product is accompanied by an original retail dealer's invoice. Any product deemed eligible for repair or replacement by BEHRINGER INTERNATIONAL under the terms of this warranty will be repaired or replaced within 30 days of receipt of the product at BEHRINGER INTERNATIONAL.

2. If the product needs to be modified or adapted in order to comply with applicable technical or safety standards on a national or local level, in any country which is not the country for which the product was originally developed and manufactured, this modification/adaptation shall not be considered a defect in materials or workmanship. The warranty does not cover any such modification/adaptation, irrespective of whether it was carried out properly or not. Under the terms of this warranty, BEHRINGER INTERNATIONAL shall not be held responsible for any cost resulting from such a modification/adaptation.

3. Free inspections, maintenance/repair work and replacement of parts are expressly excluded from this warranty, in particular if caused by inappropriate use. Likewise, the warranty does not cover defects of expendable parts caused by normal wear of the product. Expendable parts are typically faders, potentiometers, switches and similar components.

4. Damages/defects caused by the following conditions are not covered by this warranty:

- misuse, neglect or failure to operate the unit in compliance with the instructions given in the user or service manuals.
- connection or operation of the unit in any way that does not comply with the technical or safety regulations applicable in the country where the product is used.
- damages/defects that are caused by force majeure or by any other condition beyond the control of BEHRINGER INTERNATIONAL.

5. Any repair carried out by unauthorized personnel will void the warranty.

6. Products which do not meet the terms of this warranty will be repaired exclusively at the buyer's expense. BEHRINGER INTERNATIONAL will inform the buyer of any such circumstance. If the buyer fails to submit a written repair order within 4 weeks after notification, BEHRINGER INTERNATIONAL will return the unit C.O.D. with a separate invoice for freight and packing. Such cost will also be invoiced separately when the buyer has sent in a written repair order.

§ 5 WARRANTY TRANSFERABILITY

This warranty is extended exclusively to the original buyer (customer of retail dealer) and is not transferable to anyone who may subsequently purchase this product. No other person (retail dealer, etc.) shall be entitled to give any warranty promise on behalf of BEHRINGER INTERNATIONAL.

§ 6 CLAIM FOR DAMAGES

Failure of BEHRINGER INTERNATIONAL to provide proper warranty service shall not entitle the buyer to claim (consequential) damages. In no event shall the liability of BEHRINGER INTERNATIONAL exceed the invoiced value of the product.

§ 7 OTHER WARRANTY RIGHTS

This warranty does not exclude or limit the buyer's statutory rights provided by national law, in particular, any such rights against the seller that arise from a legally effective purchase contract.

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